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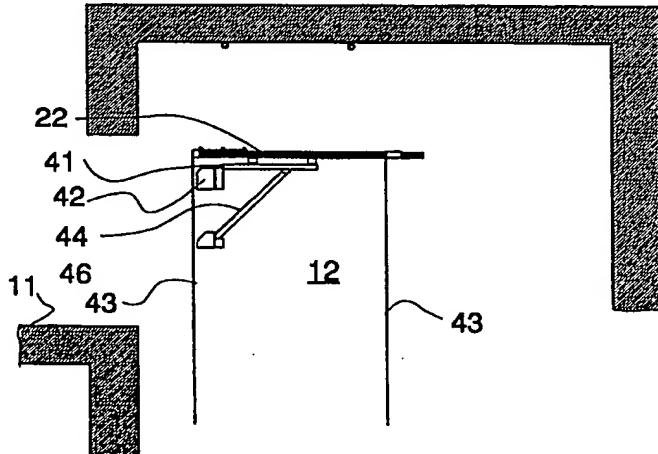
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(54) Title: PROCEDURE AND APPARATUS FOR THE INSTALLATION OF AN ELEVATOR



(57) Abstract

The invention relates to a procedure and an apparatus for plumbing and installing the shaft equipment for an elevator. A plumbing jig (22) is mounted in the upper part of the elevator shaft from the top floor (11), plumb lines (43) are attached to the plumbing jig from the top floor (11) and, using the plumb lines (43) attached to the plumbing jig (22), the shaft equipment (28) is positioned, whereupon the shaft equipment (28) is fixed in place. The apparatus of the invention comprises supporting elements (41) that can be fixed to the elevator shaft, a plumbing jig (22) that can be attached to the supporting elements (41) and mounted substantially from the top floor (11), and plumb lines (43) that can be suspended from the plumbing jig (22) and extend into the elevator shaft (2) below the plumbing jig.

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## PROCEDURE AND APPARATUS FOR THE INSTALLATION OF AN ELEVATOR

The present invention relates to a procedure as defined in the preamble of claim 1 and to an apparatus as defined in the 5 preamble of claim 10 for use in the installation of an elevator.

- For trouble-free operation of an elevator, it is necessary that the elevator should run along a vertical line. The 10 elevator is normally installed in an elevator shaft built from concrete. The guide rails for the elevator car and counter-weight are fixed to the shaft walls using rail fixtures. During the installation of the elevator, the guide rails and other shaft equipment are adjusted to their proper positions. 15 In this context, shaft equipment refers to guide rails, landing doors and their mounting brackets. In the vertical direction, the alignment is effected using plumb lines, which are fixed at a point above the shaft equipment to be installed in the elevator shaft and which extend through the whole length 20 of the shaft. It has also been suggested that the alignment could be done using a laser beam, but this method has not gained ground due to the costs and the difficult conditions at the site of installation.
- 25 In prior art, the plumb lines are fixed to the floor of a machine room above the shaft and so positioned that they can be used to align the shaft equipment, such as guide rails, and the landing doors. The ceiling of the elevator shaft must be provided with holes for the plumb lines.

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- The object of the present invention is to develop a new solution for plumbing the shaft equipment in an elevator shaft to their proper positions, a solution that does not require any communication with a space above the shaft and that can be 35 implemented without working above the finished building. To achieve this, the procedure of the invention is characterised

by the features presented in the characterisation part of claim 1. The apparatus of the invention is characterised by the features presented in the characterisation part of claim 10. The features of certain other preferred embodiments are 5 defined in the sub-claims.

When the solution of the invention is used, all the operations required in elevator installation can be carried out from the elevator shaft or from a landing. When trimming the 10 plumbing jig, the installers can work from a landing, so no scaffolding or temporary erecting stages are needed. The job can be performed substantially faster than before, when it was necessary to build a scaffolding for work in the elevator shaft or when the work was done from the roof and a passage 15 to the roof had to be provided in addition to a separate connection between the elevator shaft and the space above the shaft. Now, there is no need for elevator installers to go to the roof at any stage, so this allows a clear distinction to be made between elevator installation and other construction 20 work. In the case of an elevator without machine room, the installers can directly communicate with each other throughout the installation process.

By using the solution of the invention, the plumbing of all 25 shaft equipment, guide rails and landing door mounting brackets can be effected with four plumb lines when a gauge is used to position the guide rails for the counterweight. This also contributes towards faster installation and, by using a suitable gauge, the guide rails can be installed so that 30 their guide surfaces will be in correct positions relative to each other.

A frame used for the plumbing, i.e. a plumbing jig, fixes the 35 positions of shaft equipment at their proper locations in the vertical direction. When the plumbing jig is moved horizontally during fine adjustment at the final plumbing stage, the

various pieces of shaft equipment of the elevator remain in correct positions relative to each other. Thus, if the position of one of the plumb lines has to be readjusted, this can be done without separately readjusting the other plumb lines.

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In the following, the invention will be described in detail the aid of some of its preferred embodiments by referring to the attached drawings, in which

10 Fig. 1 presents an elevator shaft in lateral view,

Fig. 2 presents a plumbing jig in top view,

15 Fig. 3 presents an arrangement according to the invention in lateral view,

Fig. 4 presents another arrangement according to the invention in lateral view,

20 Fig. 5 presents a third arrangement according to the invention in lateral view,

Fig. 6 presents a fourth arrangement according to the invention in lateral view,

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Fig. 7 presents a fourth arrangement according to the invention viewed from the top floor.

30 Fig. 1 presents a cross-section of an elevator shaft 2 in side view. The shaft comprises a back wall 4 and a front wall 6, the latter being provided with door openings 8 at the landings 10 and 11, and side walls 12. The shaft extends somewhat below the lowest floor, forming a pit 20 in which the shaft equipment needed below the elevator car is installed. At the top, the shaft is delimited by the ceiling 16 of the shaft. The door openings are provided with temporary

safety walls 18, which may consist of e.g. plastic plates, wooden beams or steel bars. According to a first alternative embodiment of the invention, the shaft is provided with supporting elements 14 fixed to the side walls of the shaft 5 above the top floor 11, on which elements the plumbing jigs 22 can be mounted as described below in detail.

The plumbing jig 22 (Fig. 2) is mounted using telescopic tubes 24 placed on the supporting elements 14, the tubes being adjusted to a length corresponding to the shaft width. The telescopic tubes 24 are attached to profiled bars comprised in the supporting elements 14. When the supporting elements 14 and the tubes 22 are mounted, their straightness is verified by means of a spirit level. The plumbing jig consists of two side bars 26 which, in the depth direction of the shaft, extend from the shaft door toward the back wall of the shaft to the plane of the guide rails 28. Fixed to the door-side ends of the side bars 26 are square elbows 30, which are further attached to a front bar 32 connecting the square elbows 30 to each other. The square elbows are adjustably attached to the side bars and the front bar, allowing the same mounting jig to be used in elevator shafts of different dimensions. Attached to the front bar is a plumbing plate 34, which is provided with notches 36 located at the positions where the plumb lines for the landing door mounting brackets are to be set. Notches 36' and 36'' are for different elevators. Attached to the shaft-side ends of the side bars are plumbing plates 38 for the guide rails of the elevator car, the plates being provided with notches 40 for the plumb lines 43 used to plumb the guide rails 28. The attachment of the plumbing plates 38 to the side bars 26 can be adjusted according to the dimensions of the elevator shaft. Once the plumbing jig has been assembled according to the dimensions of the elevator to be installed, their mutual positions will remain unchanged. Turning or rotating the plumbing jig horizontally causes a corresponding change in the posi-

tions of all the pieces of equipment to be installed.

To carry out the plumbing, a plumbing jig assembly corresponding to the configuration of the elevator shaft is set up. The plumb lines are dropped into the shaft and fixed to the positions marked on the plumbing plates. On the shaft bottom, the positions of the guide rail lines are measured correspondingly and the plumb lines are fixed in place. At each floor, the plumb lines and the corresponding positions of guide rails and landing door mounting brackets are checked. If necessary, the plumb line positions are readjusted to bring the entire shaft into alignment. Installation of the elevator guide rails is started from the lowest guide rail, proceeding one guide rail pair at a time up to the top. The positions of the counterweight guide rails are determined by means of a special gauge 60, which is used to ensure that the guide rails are installed in a straight vertical line and also that the guide rail guide surfaces are perpendicular and in alignment with the guide surfaces of other guide rails. The gauge comprises a bar 62 placed between the guide rails in the shaft and provided with aligning points for a plumb line 43, and a rod 64 between the counterweight guide rails 67 and 68 and a rod 66 between one 68 of the counterweight guide rails and one 28 of the car guide rails.

Figures 3, 4 and 5 illustrate different arrangements for mounting the supporting elements for the plumbing jig in the elevator shaft. In Fig. 3, a supporting element has been fixed to a shaft wall. The supporting element consists of a horizontal bar 41 whose one end is fastened to an adapter plate 42 bolted to the wall while the other end rests on an oblique supporting bar 44. The supporting bar is attached by its lower end to another adapter plate 46. When the supporting element is being mounted, the adapter plates are used to adjust the supporting element so as to bring it into a horizontal position and into alignment with another supporting

element mounted on the opposite shaft wall. The adapter plates are placed on the shaft wall adjoining the landing, so the supporting elements are easily accessible and adjustable during installation. The supporting element is preferably 5 mounted above the top floor so that it is at a suitable height for installers working on the floor and that the fixtures for all guide rails can be easily positioned by means of the plumb lines 43. The plumbing jig 22 is placed on and attached to the supporting elements.

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In the embodiment illustrated by Fig. 4, the supporting element 48 is mounted on the top floor 11, being fixed to the landing floor 50 e.g. by means of bolts 52. Alternatively, 15 the supporting element may be fixed to other landing structures. The plumbing jig 22 itself may be implemented as described above.

In a further embodiment (Fig. 5) of the invention, the supporting elements for the plumbing jig are formed from two 20 bars 54 suspended from the ceiling 16 of the elevator shaft. The bars 54 are fixed to wire cables or bars 56 whose other ends are fixed to hooks 58 mounted in the shaft ceiling. The vertical position of the supporting elements is adjusted e.g. by means of an adjusting screw fitted at the lower end of bar 25 56. In this case, the supporting element is preferably placed at a suitable working height relative to the top floor. The plumbing jig 22 may be implemented as described above.

In the fourth embodiment to install the plumbing jig (Fig. 6 30 and Fig. 7) there are mounting brackets 62, which are fixed to the door jambs 60 on the top floor 11. The brackets may also be fixed to the side walls if there is no front wall or they may be fixed to the edges of the front wall on the both sides of the door openings 8. According to this embodiment 35 the plumbing jig 22 can be fixed easily and the mounter does not need to stretch himself to the shaft when fixing the

plumbing jig.

In the foregoing, the invention has been described by the aid of one of its embodiments. However, the presentation is not  
5 be regarded as constituting a restriction of the sphere of patent protection, but the embodiments of the invention may be varied within the limits defined by the following claims.

## CLAIMS

1. Procedure for positioning and mounting the shaft equipment (28) to be installed in an elevator shaft (2), in which procedure the various pieces of shaft equipment (28) are positioned using plumb lines (43) attached to a plumbing jig (22) and fixed in place after the positioning, characterised in that
  - the plumbing jig (22) is mounted in the upper part of the elevator shaft (2) working on the top floor (11),
  - the plumb lines (43) are attached to the plumbing jig (22) working on the top floor (11).
2. Procedure as defined in claim 1, characterised in that the plumbing jig (22) is mounted on a carrier (54) suspended from the ceiling (16), said carrier (54) being mounted in place from the top floor (11).
3. Procedure as defined in claim 1, characterised in that the plumbing jig (22) is mounted on a carrier (48) fixed to the landing (50) of the top floor (11).
4. Procedure as defined in claim 1, characterised in that the plumbing jig (22) is mounted on supporting elements (41,42) attached to the walls (12) of the elevator shaft.
5. Procedure as defined in any one of claims 1, characterised in that the plumbing jig (22) is mounted to the jambs of the top floor door or to the structure of the front wall of the top floor
6. Procedure as defined in any one of claims 1 - 5, characterised in that the plumbing jig (22) is mounted above the top floor (11).

7. Procedure as defined in any one of claims 1 - 6, characterised in that the shaft equipment (28) is positioned using a plumb line (43) and a gauge (62,66,67) placed between the plumb line (43) and the shaft equipment.

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8. Procedure as defined in any one of claims 1 - 7, characterised in that, to install shaft equipment (28), the shaft equipment is lifted from the bottom of the shaft (20) using the elevator car.

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9. Procedure as defined in any one of claims 1 - 8, characterised in that the plumbing jig is mounted and the plumb lines are positioned into the shaft without any scaffolds or ladders.

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10. Apparatus for the plumbing and installation of shaft equipment for an elevator, characterised in that the apparatus comprises supporting elements (41;48;54) that is fixable to the elevator shaft (2), a plumbing jig (22) that is attachable to the supporting elements (41;48;54) and mountable substantially from the top floor (11), and plumb lines (43) that are suspendable from the plumbing jig and that extend into the elevator shaft (2) below the plumbing jig (22) and are used to align at least one guide rail.

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11. Apparatus as defined in claim 10, characterised in that the supporting elements (41;48;54) are fixable to the shaft walls (12), to a floor (11), to the shaft ceiling (16) or to the door jambs

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12. Apparatus as defined in claim 10 or 11, characterised in that it comprises four plumb lines (43) and a gauge (62,66,67).

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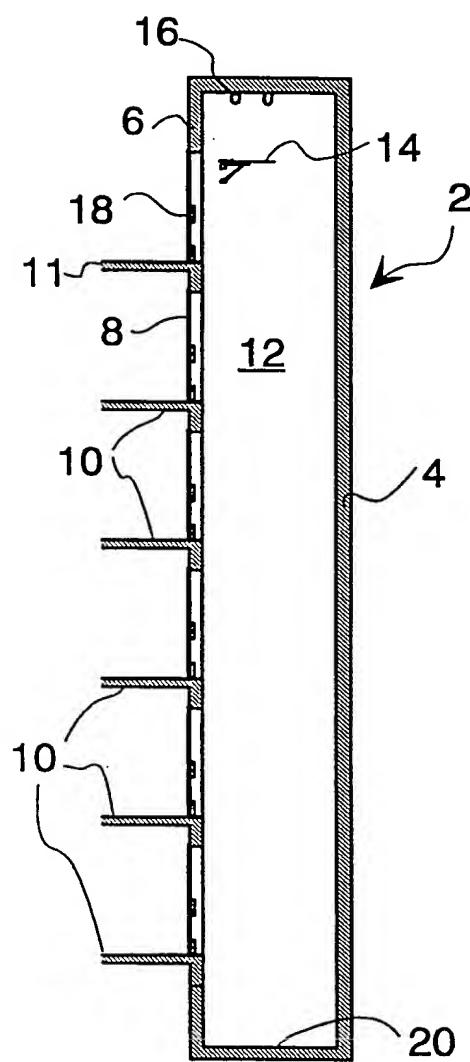


Fig. 1

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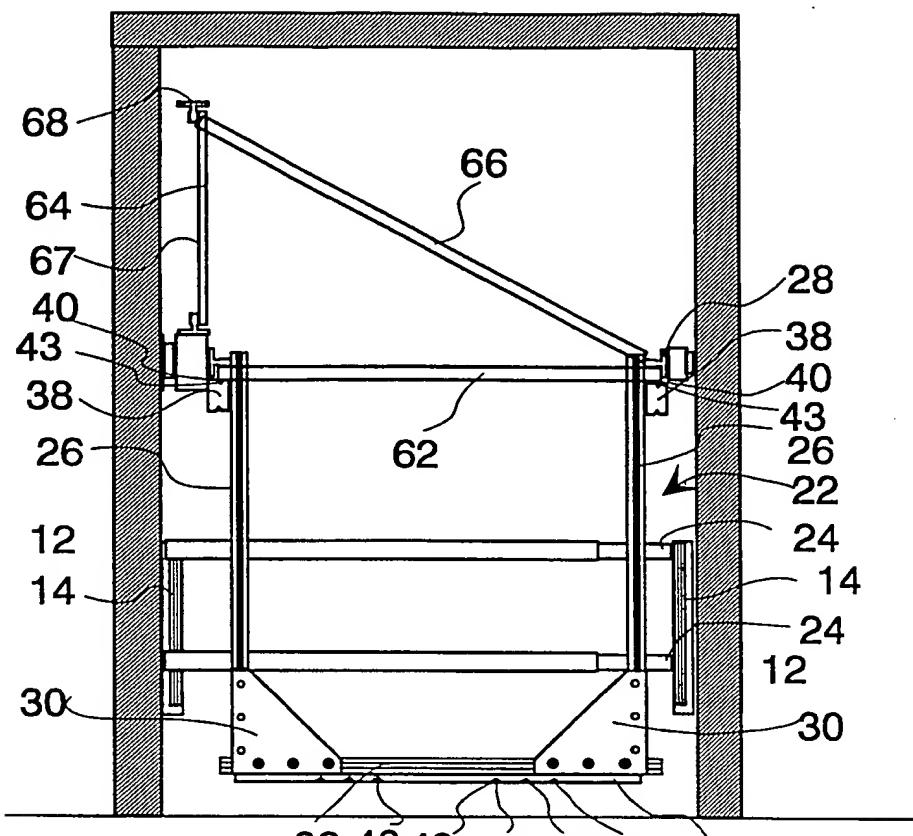


Fig. 2

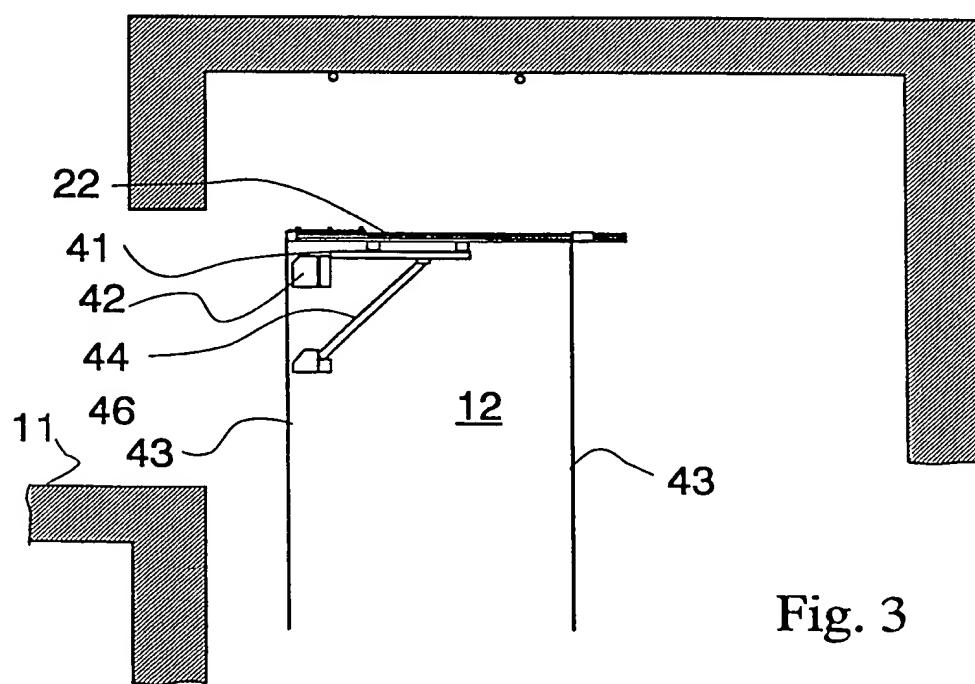


Fig. 3

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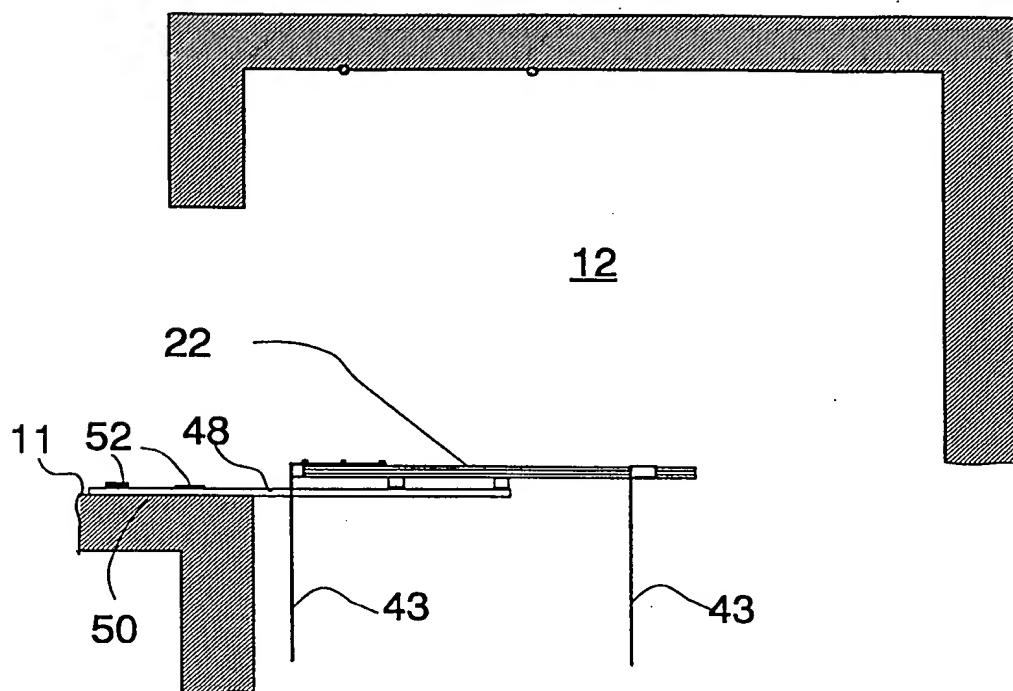


Fig. 4

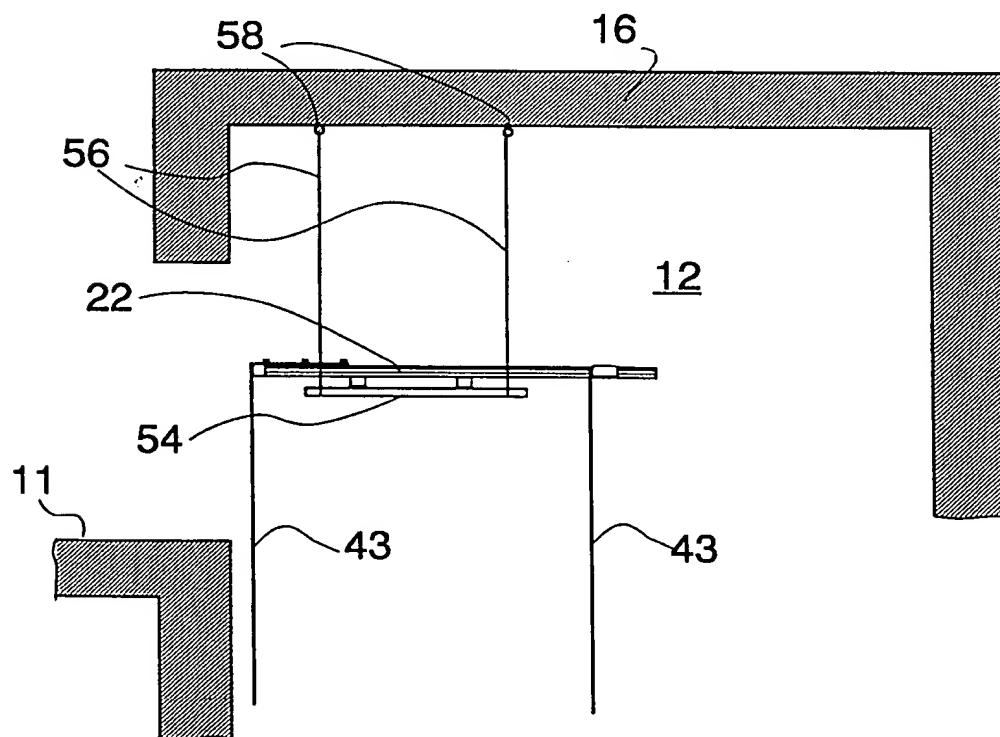


Fig. 5

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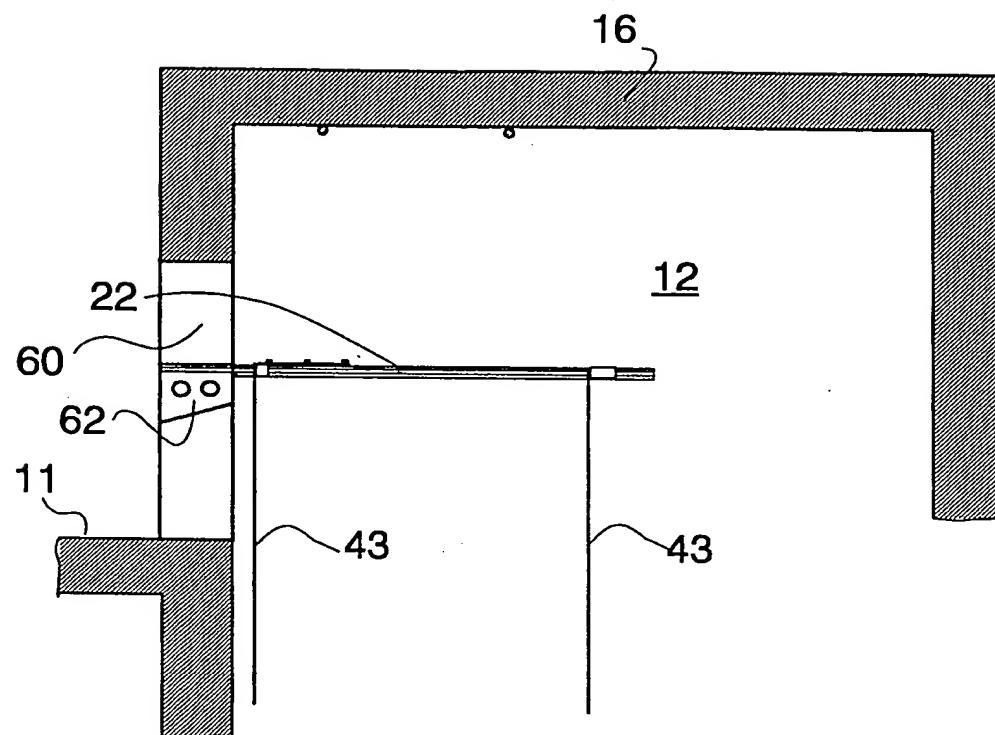


Fig. 6

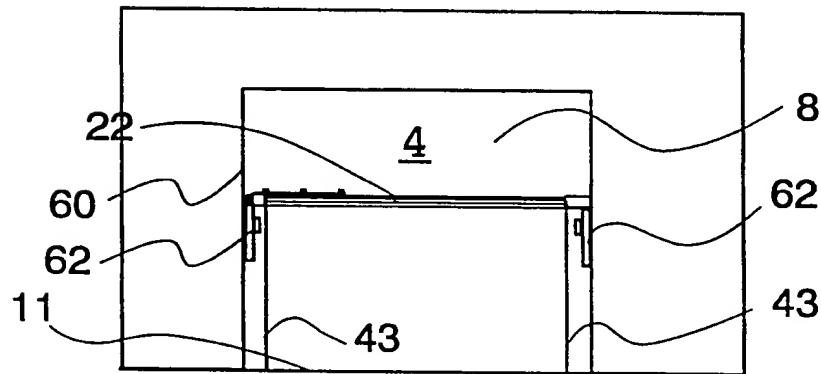


Fig. 7

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/FI 98/00205

## A. CLASSIFICATION OF SUBJECT MATTER

## IPC6: B66B 19/00

According to International Patent Classification (IPC) or to both national classification and IPC

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## WPI, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2194984 A (OTIS ELEVATOR COMPANY), 23 March 1988 (23.03.88), page 2, line 64 - line 66, figures	10-12
A	--	1,4,6
X	PAJ, JP6009173, MITSUBISHI ELECTRIC CORP: "Upper art template device for installing elevator", 940118, figure 3	10,11
A	--	1,4
A	US 5065843 A (D. RICHARDS), 19 November 1991 (19.11.91), column 4, line 3 - line 8, figure 4	1,6,9,10,11
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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PAJ, JP 5186160, MITSUBISHI ELECTRIC CORP: "Elevator centring device", 930727, figure 2  -- -----	

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

29/04/98

International application No.
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Patent document cited in search report	Publication date		Patent family member(s)	Publication date
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